



### ANNOUNCEMENTS

#### *Aeronomy Lab and Industry Write Success Story*

DuPont announced recently that it has begun commercial production of a replacement for the now-banned Halon 1211 that is used in portable fire extinguishers. The replacement, which is known as HFC-236fa, was the subject of extensive laboratory work by scientists in the Atmospheric Chemical Kinetics Program and model calculations by the Middle Atmosphere Program to determine the compound's ozone depletion potential and global warming potential. Finding substitutes for the halons in fire extinguishers has been especially challenging, and DuPont cites HFC-236fa as the first replacement compound that possesses the combined traits of exceptional safety, comparable performance, and zero ozone-depletion potential.

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#### *CIRES Review Upcoming*

The NOAA Scientific Review of CIRES will take place on April 16-18. The Review includes four poster sessions on April 16 that will feature the work of CIRES researchers associated with NOAA laboratories in Boulder, including the Aeronomy

Laboratory. The review panel consists of a small number of external scientists who will be attending the poster sessions, touring the laboratories, and discussing the NOAA/CIRES research partnership with the CIRES Fellows, the NOAA Laboratory Directors, and CIRES/NOAA researchers. The insights of the reviewers will be helpful in CIRES efforts to integrate research across NOAA and the University so as to meet the research and education goals of both organizations. Fred Fehsenfeld is organizing the Aeronomy Lab's participation in the poster sessions and lab tours. Your attendance at the poster sessions is welcomed; they will be held at the CIRES building on the CU main campus.

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#### *Glimpse the Future*

With bulldozers beeping in the background and the new building materializing before your very eyes, you may be wondering what the finished product will look like. You can get a sneak preview from a computer-generated "photo," strategically located (to enhance contemplation) above the water fountain on the second floor of Building 24. NOAA has a Web page on the new building that gives construction updates and includes a photo library of the work-in-progress (<http://boulder.noaa.gov/building.html>).

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**John Daniel** is one of only sixty young scientists nationwide to receive the Presidential Early Career Award for Scientists and Engineers. The Award was presented to John at the White House by the President's science advisor, John Gibbons, on 16 December. John was cited for his contributions to providing the scientific foundation for national and international decisionmaking on the topics of stratospheric ozone depletion and climate change. The Presidential Early Career Award is the highest honor bestowed by the U.S. government each year upon outstanding scientists and engineers at the beginning of their careers.

A research paper co-authored by Aeronomy Lab scientist **George Mount** was selected in the Naval Research Laboratory's annual "best paper" competition: R.R. Conway, M.H. Stevens, J.G. Cardon, S.E. Zasadil, C.M. Brown, J.S. Morrill, and G.H. Mount, Satellite measurements of hydroxyl in the mesosphere, *Geophysical Research Letters* 23, 2093-2096 (1996).

**A.R. Ravishankara** has been selected to become a Fellow of the American Geophysical Union. This honor is bestowed on less than 0.1% of the membership of AGU. Ravi's citation reads "*for innovative laboratory investigations of the kinetics and photochemistry of atmospheric trace species and the insightful interpretations that have improved our quantitative understanding of stratospheric ozone depletion and greenhouse gases.*" Ravi will be presented with the certificate of Fellowship at the Fall Meeting of the AGU in December.

**David Fahey, George Mount, and Ravi** are now serving as associate editors of the *Journal of Geophysical Research - Atmospheres*. Also, **Dave** is on the editorial board of the *Journal of Atmospheric Chemistry* and **Ravi** is the advisory editor of *Chemical Physics Letters*. **Warner Ecklund** is an associate editor of the *Journal of Oceanic and Atmospheric Technology*. Both **Ravi** and **Carl Howard** are longstanding members of the NASA Panel for Data Evaluation.

## The Flatland Atmospheric Observatory

To atmospheric scientists studying dynamical properties of the lower and middle atmosphere, the lure of flat land is strong. That unassuming terrain is precisely what enables researchers to focus on gravity wave behavior of the atmosphere – it enables them to discount the otherwise complicating atmospheric factors that mountainous topography creates. And it also explains why scientists in the Atmospheric Dynamics Program of the Aeronomy Lab have a long history of research on atmospheric gravity waves at the Flatland Atmospheric Observatory (FAO), located in a vast expanse of corn and soybeans near Champaign-Urbana, Illinois.

In fact, February 1997 marked the tenth anniversary of the Aeronomy Lab's research at the FAO. It began with a single-beam 50 MHz profiler radar looking vertically to measure wind profiles. By the end of 1991, the site was fully instrumented with five-beam 50-MHz and 915-MHz radars. The radars provide scientists with a "one-two punch" in their study of the atmosphere's dynamics: the 50-MHz radar can profile winds up to about 15 kilometers, and the 915-MHz radar gives a focused look at winds in the lowermost five kilometers of the atmosphere. Those radars are accompanied by an array of pressure sensors that enables scientists to measure the speed and direction of atmospheric waves as they pass, a laser ceilometer to measure the height of the cloud base, and a suite of meteorological instruments to measure atmospheric parameters such as temperature, humidity, and solar insolation.

Scientist Tom Van Zandt, who heads the Atmospheric Dynamics Program, explains that the FAO is the "offspring" of earlier research with the Aeronomy Laboratory radar at Sunset in the mountains west of

Boulder, which was the first U.S. profiler. That effort began in the early 1970s and after a little over a decade, it became clear that "mountain waves" were overwhelming the short-period gravity wave phenomena that are smaller in magnitude but more generally characteristic of the atmosphere.

The FAO ensemble is truly "one of a kind" because it operates continuously (the other primary approach to measuring wind profiles is to make periodic balloon launchings). Only a couple of half-day visits per week from a local engineer are required during routine operation of FAO, with maintenance and upgrades accomplished by Aeronomy Lab personnel during occasional site visits. The continuous operation implies data — and lots of it. Tom, Tony Riddle, Jim Warnock, and Wally Clark carry out the analysis, in collaboration with Greg Nastrom of St. Cloud State University in Minnesota.

The efforts have enabled scientists at the Aeronomy Lab to study mesoscale dynamical processes in the troposphere and lower stratosphere. The research is used to improve the way that gravity waves are parameterized in atmospheric models. Those models lie at the heart of weather prediction, so the FAO research will improve the "batting average" of those forecasts we all rely on. Recent work at FAO, spearheaded by Wayne Angevine, has expanded to include intensive field campaigns that focus on vertical transport of trace gases in the boundary layer. This "new dimension" of FAO research continues this summer, as part of an intensive campaign to study how emissions from agricultural soils influence oxidant formation in the lower atmosphere. More on that in the next issue of this newsletter...



### HOME and AWAY

#### *New Methane Instrument Gets Its Wings*

The new methane instrument being developed by Erik Richard and Ken Kelly of the Meteorological Chemistry Program made its first trip to the stratosphere in December. The instrument was flown on the NASA/U.S. Air Force WB57F high-altitude aircraft, operated out of Johnson Space Flight Center in Houston. Engineering tests were conducted during the December flights in preparation for the instrument's inaugural science flights in April.

The methane instrument uses a near-infrared tunable diode laser to make absorption measurements in a folded-path cell; it is specially designed to be lightweight and remotely operable. The WB57F, one of only two in existence, enables researchers to study the upper troposphere/lower stratosphere, a region that is inaccessible by other platforms. A rocket plume was intercepted during the engineering flights, an achievement that the scientists will attempt to repeat during future science flights. ♣

#### *Wind Profilers Team Up with DOE Program*

Aeronomy Lab scientists in the Tropical Dynamics and Climate Program have assisted the Department of Energy's Atmospheric Radiation Measurement (ARM) program with DOE's installation of the first Atmospheric Radiation and Cloud Station (ARCS) at Manus Island in Papua New Guinea in the Pacific. DOE is planning a network of five stations to study clouds, incoming energy from the sun, outgoing heat from the earth, and other climatological variables that influence meteorology in the Pacific region. The information will be used to improve understanding of weather in the Pacific Ocean, where ocean surface temperatures are the warmest in the world (with important consequences for the global climate system).

The Aeronomy Lab has maintained an Integrated Sounding System for measuring wind profiles and other meteorological variables at Manus Island since 1992; the ISS was reengineered and integrated into the instrument suite of the new DOE station. Ken Gage is on the Scientific Advisory panel for the DOE ARM Western Pacific site. ♣

## Ready, Set, ...POLARIS

In the Arctic region, stratospheric ozone has its ups and downs – with peaks in spring and minimum values in late summer/early fall. The overhead column of ozone decreases by more than 10% over a time period of 2-3 months in the late spring/early summer. What natural factors in the atmosphere's photochemistry and dynamics contribute to this behavior, and what new twists might have been added by human-made emissions of gases to the atmosphere? Answers will come from the Photochemistry of Ozone Loss in the Arctic Region in Summer (POLARIS) campaigns, due to start in April.

Members of the Meteorological Chemistry Program and the Middle Atmosphere Program are gearing up for the first of three four-week field campaigns. Flights of the NASA ER-2 high-altitude research aircraft will be based out of Fairbanks, Alaska, and will cover the northern high latitudes from about 40°N nearly to the North Pole. Campaigns in April, early July, and mid-September will give researchers three intensive looks at the seasonal behavior of ozone photochemistry and transport. The Aeronomy Lab scientists will be in the company of about 100 other scientists and support personnel that are part of POLARIS, which is an international experiment coordinated by NASA. Aeronomy Lab scientist David Fahey is one of two Project Scientists of the POLARIS campaign.

Researchers in the Meteorological Chemistry Program will have instruments for measuring ozone and reactive nitrogen compounds aboard the NASA ER-2 high-altitude research aircraft. Those measurements give scientists an important handle on the photochemistry that destroys stratospheric ozone. Aeronomy Lab scientists are also collaborating with the Climate Monitoring and Diagnostics Laboratory to make measurements of long-lived trace gases using the Airborne Chromatograph for Atmospheric Trace Species (ACATS) instrument. That data will lead to a greater understanding of the dynamics (air motions) that influence ozone transport in the region. Scientists in the Middle Atmosphere Program will evaluate the role of chemical loss cycles in stratospheric ozone behavior in the Arctic by using a photochemical-dynamical model in comparison with the suite of POLARIS measurements.

Insights from the measurements and modeling activities of POLARIS will greatly increase the ability to explain observed and future changes of ozone abundances in the Arctic region. In particular, POLARIS will enhance the scientific understanding of the effects of aviation on that region, a topic on which the Aeronomy Lab is making a significant contribution. ♣



## Bits On Computing

The Computing and Networking Resources Group (CNRG) is evolving to meet the increasing computer needs of the Aeronomy Laboratory. We've added a new twist to the ways you can get help from us — a World Wide Web home page. It is accessible to Aeronomy Lab users via the address <http://www.al.noaa.gov:1800/> — please bookmark it. Please direct your inquiries (i.e. questions on resources and software) here whenever possible. The "Frequently Asked Questions" section might answer your question right away. Suggestions for questions and/or solutions we could add to the FAQ list are welcome.

To help us maintain efficiency, please use e-mail to contact CNRG with your problems, inquiries, etc., whenever practical ([cnrg@al.noaa.gov](mailto:cnrg@al.noaa.gov)). E-mail to the CNRG address is logged into our task queue and is seen by all members of the group. It is also read by those of us who may be out of town at the time. If you are seeking walk-in assistance, our "front line" is staffed by Jenny and Ken, so that Cathy and Walt can focus on Lab-wide computing issues and installations.

—Walt, Cathy, Jenny, and Ken



## WHAT'S UP WITH PEOPLE

**Rod Jones** is visiting the Aeronomy Laboratory for a few weeks from Cambridge University in England. He is working with several AL scientists on modeling and instrumentation ideas, with a particular interest in studies of how temperature affects lower stratospheric chemistry. He'll be here until mid-March... **Dick Norton** has retired after 40 years of federal service. He is working part-time in the Tropospheric Chemistry Program through CIRES... **LeAnn Droppleman** is the new secretary for the Atmospheric Chemical Kinetics Program; she started on February 3... **Barbara Herrli** has recently moved to Building 24, where she is the secretary for the Atmospheric Dynamics and the Tropical Dynamics and Climate Programs... **Debe Fisher** has been serving as "utility infielder" in several secretarial positions at the Aeronomy Lab since last fall. She is now helping the Meteorological Chemistry Program and the Admin Office in various assignments... **Ken Jamieson** has joined the Computing and Networking Resources Group. In addition to his part-time work at the Aeronomy Laboratory, he is a student at the University of Colorado... **Claire Granier** has recently begun tropospheric and stratospheric modeling research with the Middle Atmosphere group... **Joe Pettitt** is working at Fritz Peak for a few months while **Jane Olson** is on sabbatical... **Stefan Bauerle** will soon leave the Atmospheric Chemical Kinetics group to return to Germany... **Jeremy**

**Zucker** is leaving the Middle Atmosphere Program to finish up at the University of Colorado and prepare for graduate school... **Alex Weaver** is moving to CIRES/CU to head up the educational outreach program that CIRES is initiating. **Susan Buhr** is working with her on that project...

## COMMUNICATING OUR SCIENCE

**To Decisionmakers:** Dan Albritton, Carl Howard, and Ravi participated in the visits of six Congressional staffers to Boulder on February 19. The staffers were presented with scientific updates on the topics of climate change, stratospheric ozone depletion, air quality, and the winter oxyfuels program. Dan Albritton also briefed two staffers who visited on 31 January... Fred Fehsenfeld and Dan Albritton participated in North American Research Strategy for Tropospheric Ozone (NARSTO) Synthesis Team meeting in Atlanta on Feb 11-13. Participants from the U.S., Canada, and Mexico refined the plans for completing the first regional ozone assessment, due out late next year.

**To the Scientific Community:** The results of the 1993 summer intensive of the North Atlantic Regional Experiment (NARE) were published in a special section of the December 20 issue of *Journal of Geophysical Research*. Fred Fehsenfeld served as guest editor and Aeronomy Lab scientists were lead or co-authors of several of the papers... The Airborne Southern Hemisphere Ozone Experiment/Measurements for Assessing the Effects of Stratospheric Aircraft (ASHOE/MAESA) is featured in a special section of the February issue of *Journal of Geophysical Research*. Adrian Tuck served as guest editor of this issue and also of another *JGR* special section on ASHOE/MAESA that will appear in a few months... The Tropical Dynamics and Climate Program is working with Cathy Burgdorf to put the finishing touches on a new Web site for the display of real-time lower to mid-tropospheric wind data from the wind profilers of the Trans-Pacific Profiler Network.

**To Media and the Public:** Susan Solomon was featured in an article that appeared in the Discovery section of the Boulder *Daily Camera* newspaper on 23 January. The article describes Susan's career accomplishments, focusing especially on her work in understanding the causes of the Antarctic ozone hole... Susan also participated in a discussion of atmospheric chemistry research that was broadcast live on the University of Colorado television channel 54 on February 17.

**To Students and Teachers:** In February, Mike Proffitt gave talks at the Boulder Country Day elementary school on how ozone is measured in the atmosphere... Jeff Hicke talked to several classes at Brighton Heritage School about atmospheric science on February 3... Alex Weaver gave a workshop for 15 elementary school teachers in November, covering stratospheric ozone and Antarctic research. Alex also was the science consultant for the new

National Geographic video called "Investigating Global Warming". It is aimed at middle school level and will reach about 6 million students... In February, Susan Solomon talked to an enthusiastic third-grade class at Bear Creek Elementary School about Antarctica, the ozone hole, and of course... penguins... Jim Burkholder judged the science fair for Louisville Middle School; Carl Howard did likewise at the Southern Hills Middle School...

**To Constituents:** Dan Albritton gave a talk on "Global Warming: What We Know and What We Don't Know" to the EPA's ten Regional Administrators on February 26. The briefing will assist the Regional Administrators in their efforts to increase public awareness of climate change and associated risks, an outreach project they are undertaking at the request of the White House.

**To Our Visitors:** Ken Gage gave a presentation in December to Rear Admiral Paul Tobin, Oceanographer of the U.S. Navy. Research of the Tropical Dynamics and Climate Program was discussed with regard to particular interests of the Navy...

## DOWN THE ROAD

**March 10-14:** 1997 Conference on the Atmospheric Effects of Aviation, Virginia Beach, Virginia. Several Aeronomy Laboratory scientists are presenting papers at the meeting.

**April 16-18:** 1997 Scientific Review of CIRES, Boulder, Colorado.

**April 16-May 15:** POLARIS first field campaign, NASA/Ames, California and Fairbanks, Alaska.

**May 19-23:** 22nd AMS Conference on Hurricanes and Tropical Meteorology, in Fort Collins. Scientists in the Tropical Dynamics and Climate Program will present papers and posters on a broad range of topics, including the analysis of observations from the Pacific profilers and from last year's Maritime Continent Thunderstorm Experiment (MCTEX).

*Seminar Series Continues (...but in a new location):*

- March 19 - Eric Keim (NOAA AL/CIRES)
- April 2 - Ping Chen (NOAA CDC)
- April 9 - Steven Eckermann (Naval Res. Lab)
- April 23 - Tom Jobson (NOAA AL)
- April 30 - Tom Ryerson (NOAA AL/CIRES)
- May 14 - Elisabeth Holland (NCAR)
- May 28 - Darin Toohey (UC Irvine)

[Except where noted, all are on Wednesdays at 3:30 p.m. Our usual seminar room is out of commission for several weeks as Building 2 undergoes renovation; these talks are all in Building 1, either in or across from the main auditorium. Please watch your e-mail notices carefully for each seminar's location.]

*On the Air!* is a quarterly publication of the NOAA Aeronomy Laboratory. Please send any comments, questions, and suggestions to: Chris Ennis (phone 303-497-7538; email [cennis@al.noaa.gov](mailto:cennis@al.noaa.gov)).

